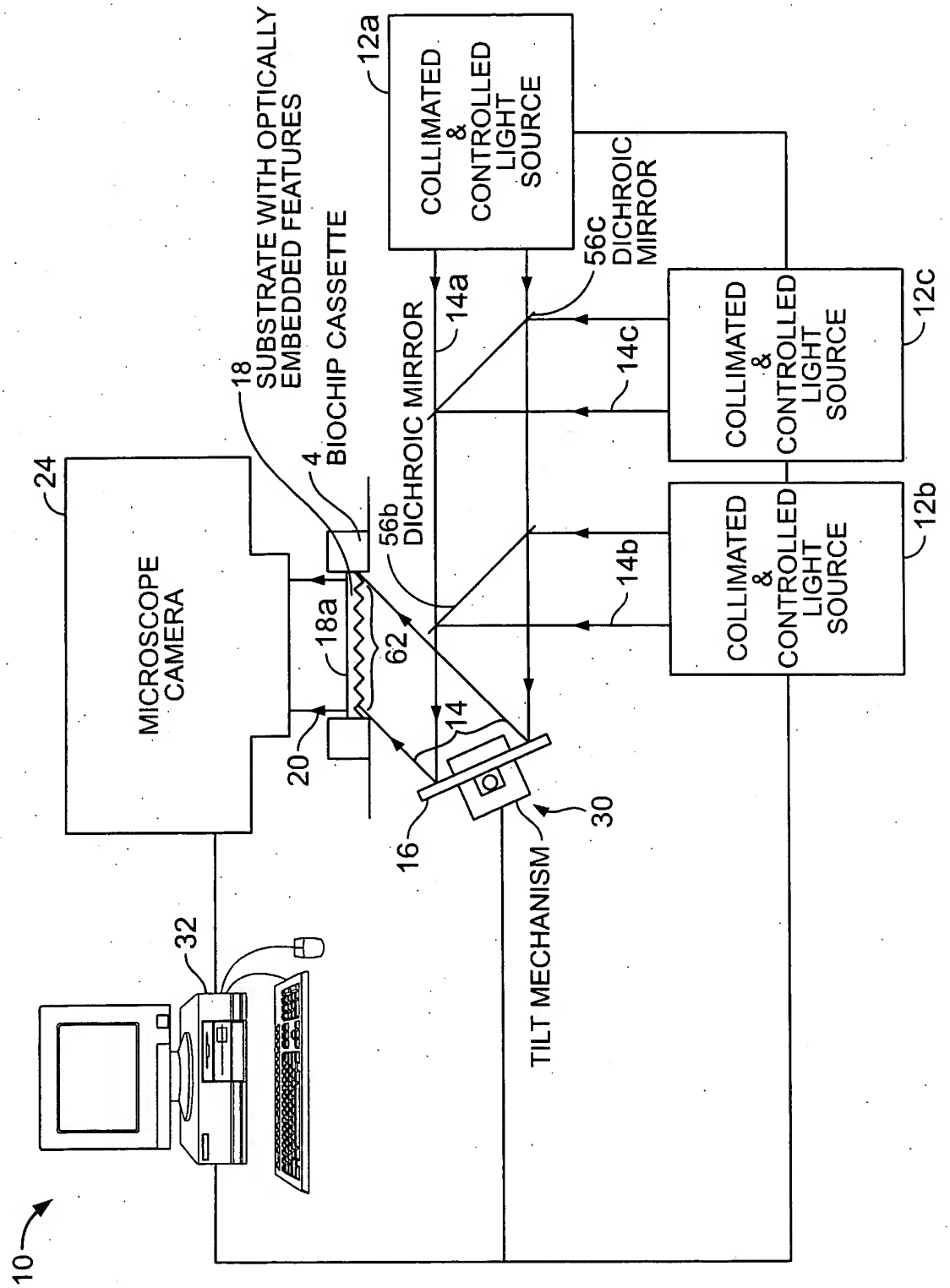


FIG. 1

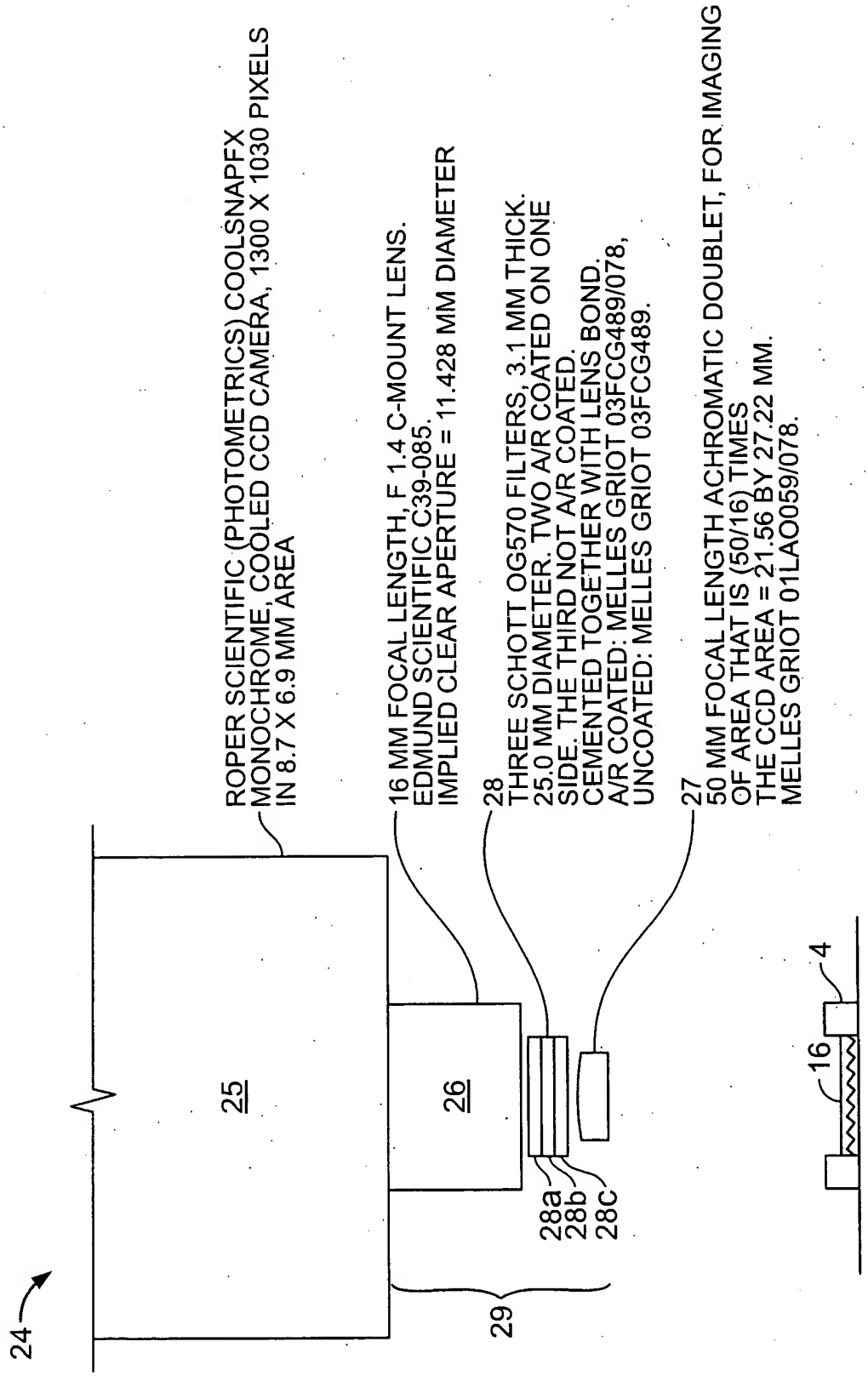

24
25
ROPER SCIENTIFIC (PHOTOMETRICS) COOLSNAPFX
MONOCHROME, COOLED CCD CAMERA, 1300 X 1030 PIXELS
IN 8.7 X 6.9 MM AREA
26
16 MM FOCAL LENGTH, F 1.4 C-MOUNT LENS.
EDMUND SCIENTIFIC C39-085.
IMPLIED CLEAR APERTURE = 11.428 MM DIAMETER
28
THREE SCHOTT OG570 FILTERS, 3.1 MM THICK.
25.0 MM DIAMETER. TWO A/R COATED ON ONE
SIDE. THE THIRD NOT A/R COATED.
CEMENTED TOGETHER WITH LENS BOND.
A/R COATED: MELLES GRIOT 03FCG489/078,
UNCOATED: MELLES GRIOT 03FCG489.
27
50 MM FOCAL LENGTH ACHROMATIC DOUBLET, FOR IMAGING
OF AREA THAT IS (50/16) TIMES
THE CCD AREA = 21.56 BY 27.22 MM.
MELLES GRIOT 01LAO059/078.
28a
28b
28c
29
16
4

FIG. 1A

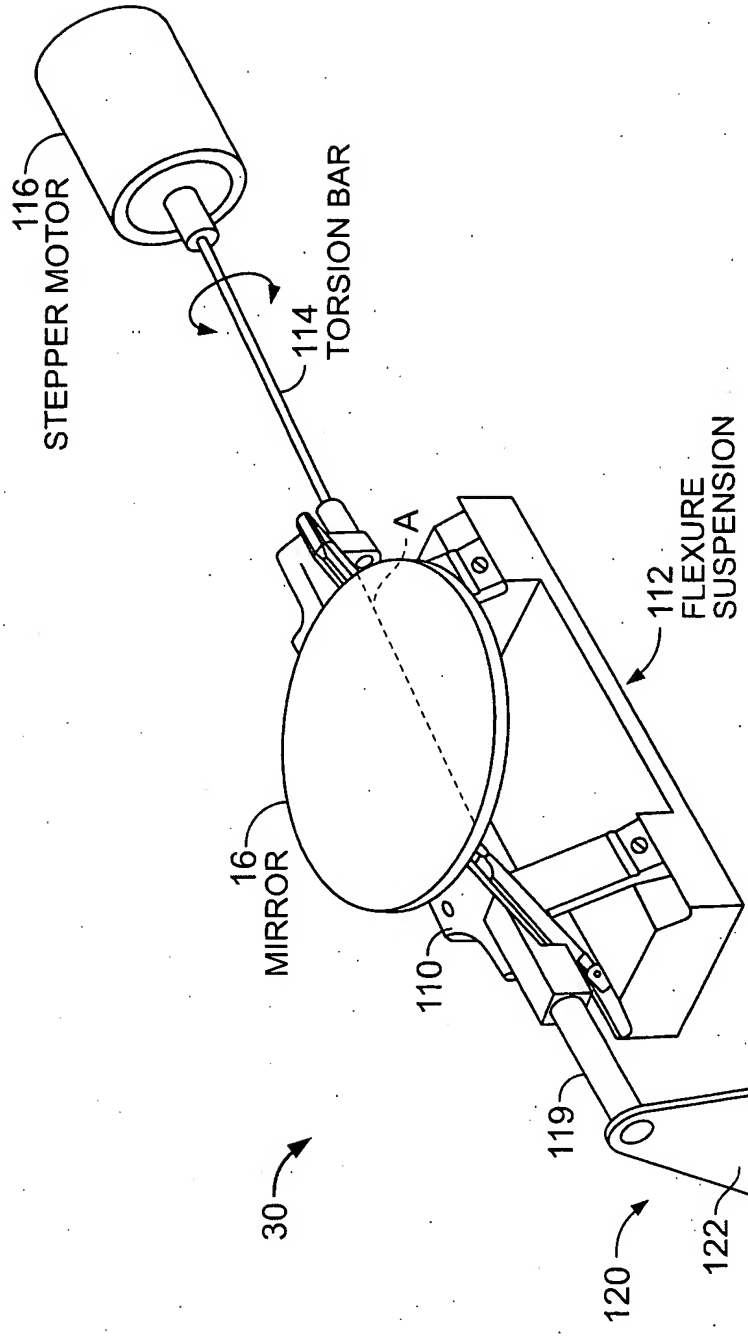

116
STEPPER MOTOR
114
TORSION BAR
A
112
FLEXURE
SUSPENSION
16
MIRROR
110
119
124
MAGNETIC
FIELD
30
120
122
M

FIG. 1B

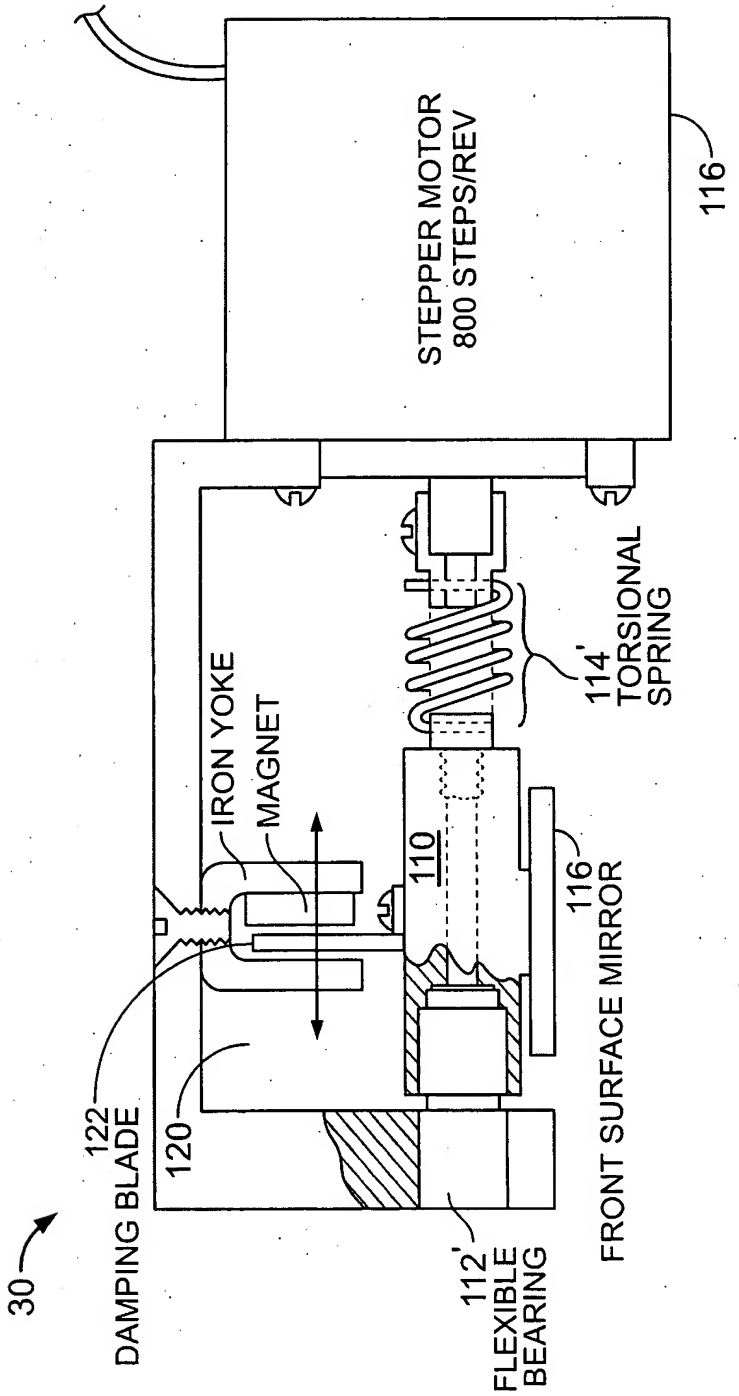

STEPPER MOTOR
800 STEPS/REV
116
114'
TORSIONAL
SPRING
IRON YOKE
MAGNET
110
116
FRONT SURFACE MIRROR
122
DAMPING BLADE
120
112'
FLEXIBLE
BEARING
30

FIG. 1C

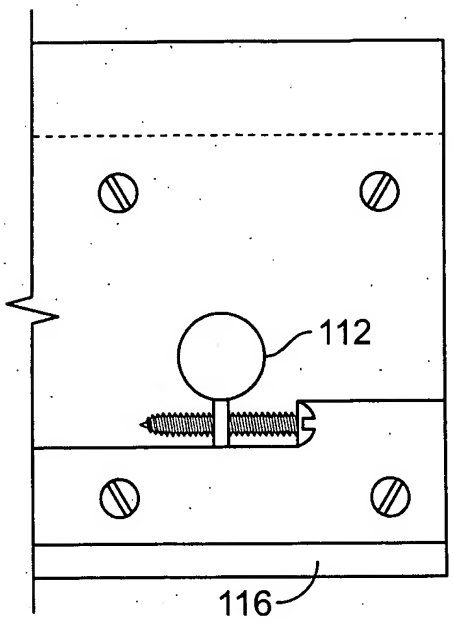


FIG. 1D

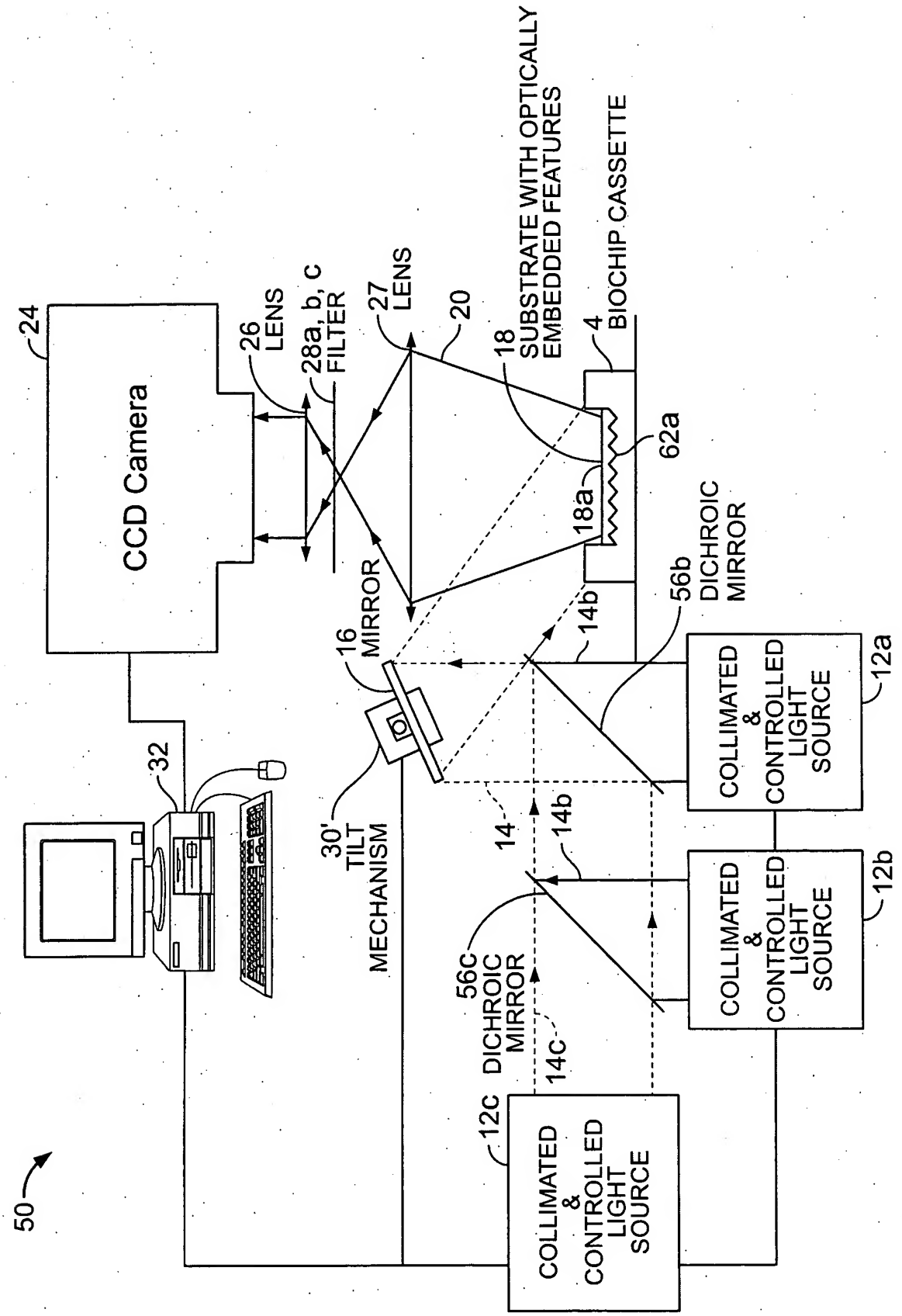

50
24
CCD Camera
26
LENS
28a, b, c
FILTER
27
LENS
20
18
SUBSTRATE WITH OPTICALLY EMBEDDED FEATURES
4
BIOCHIP CASSETTE
62a
18a
56b
DICHROIC MIRROR
16
MIRROR
14b
12a
COLLIMATED & CONTROLLED LIGHT SOURCE
32
30'
TILT MECHANISM
14
14b
56c
DICHROIC MIRROR
12b
COLLIMATED & CONTROLLED LIGHT SOURCE
14c
12c
COLLIMATED & CONTROLLED LIGHT SOURCE

FIG. 2

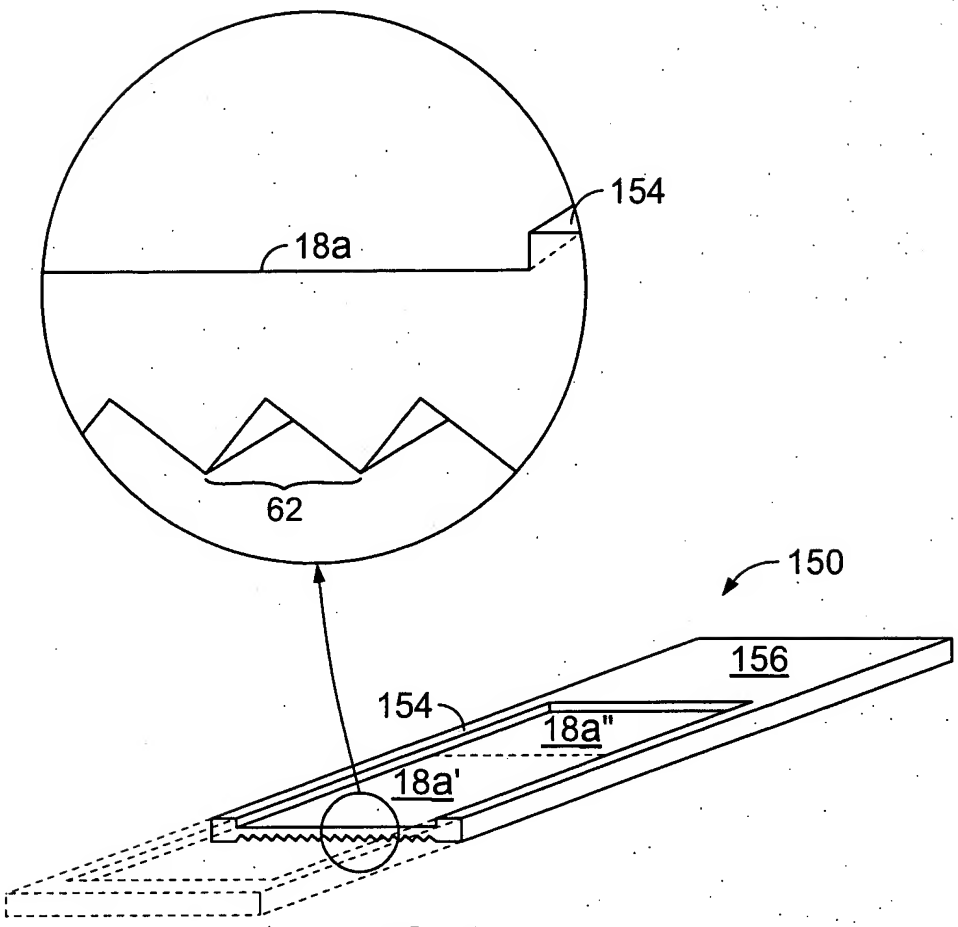


FIG. 3

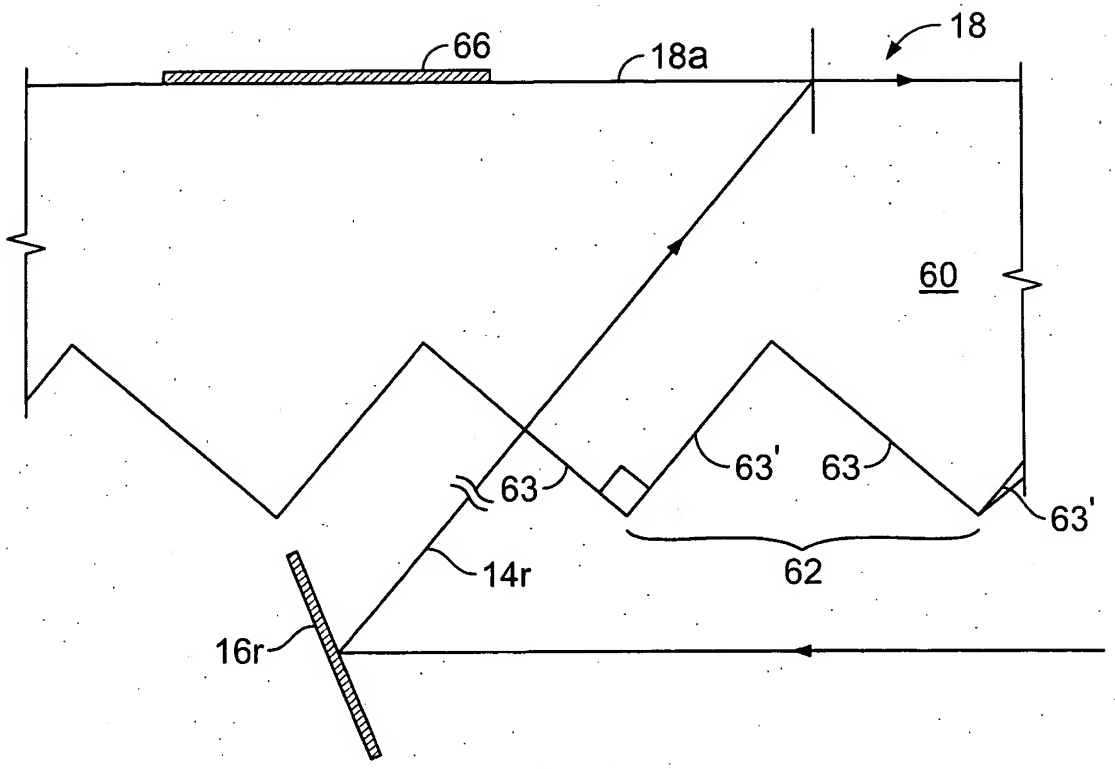


FIG. 3A

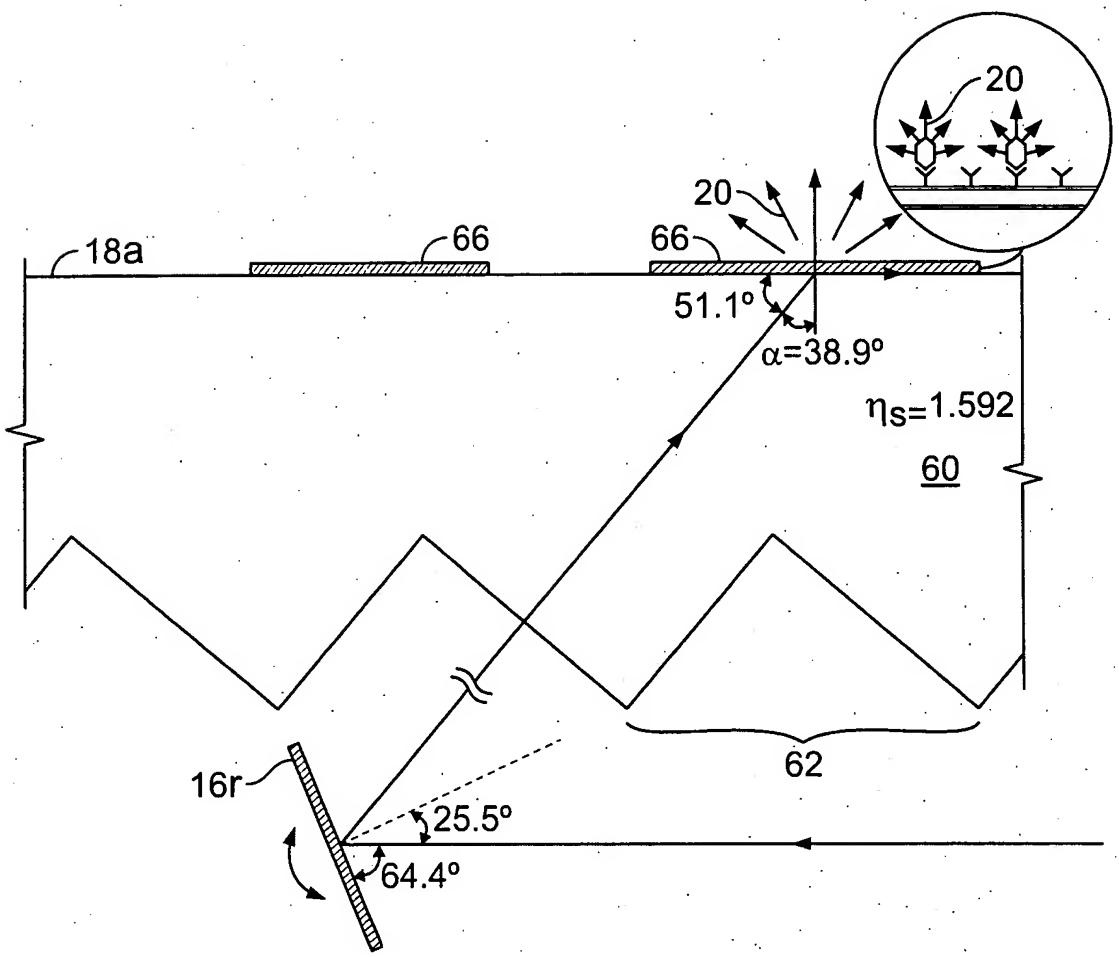


FIG. 3B

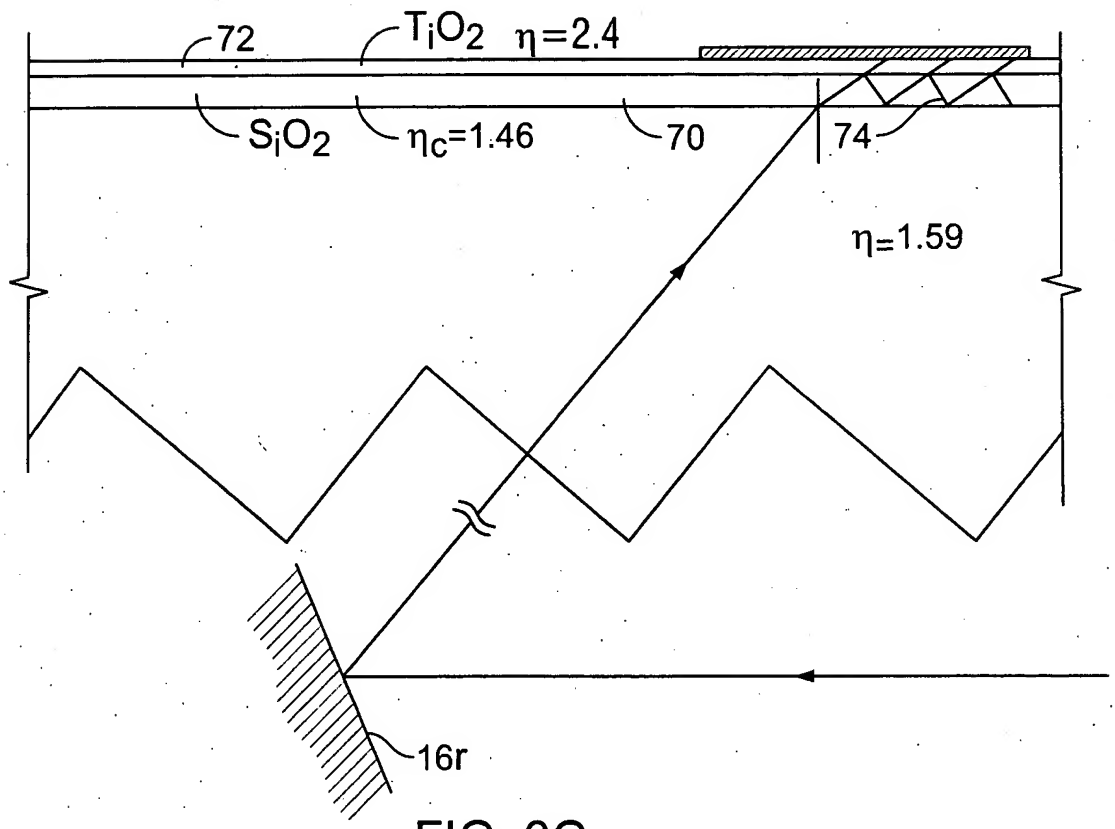


FIG. 3C

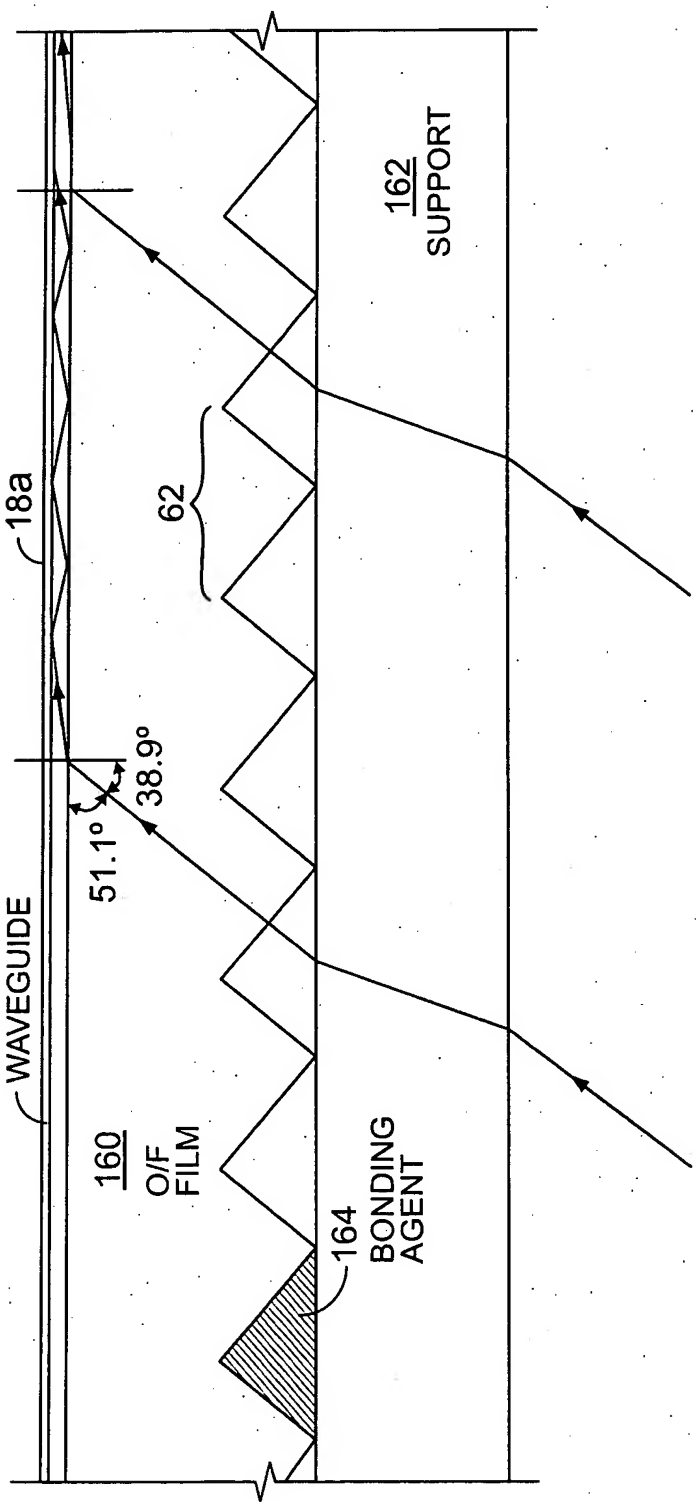

162
SUPPORT
62
18a
38.9°
51.1°
WAVEGUIDE
160
O/F
FILM
164
BONDING
AGENT

FIG. 3D

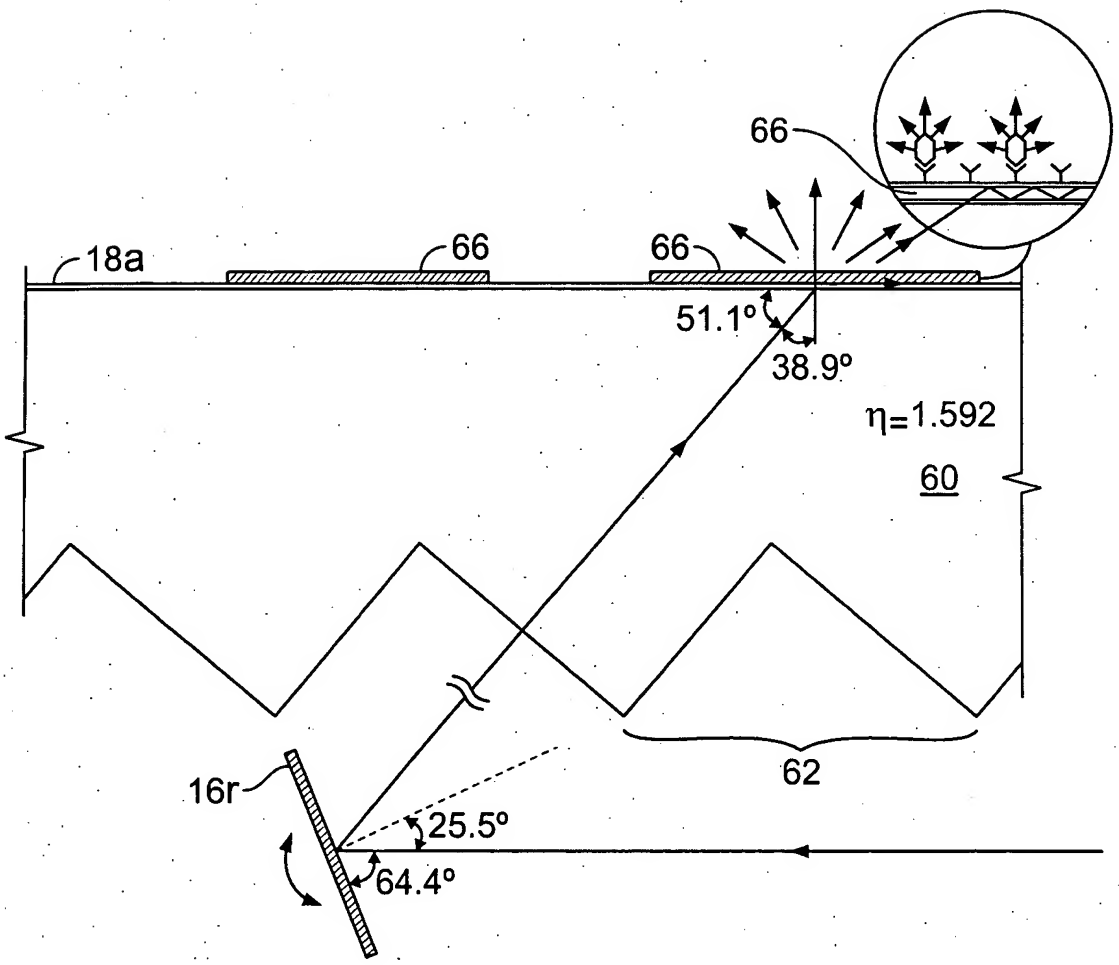


FIG. 3E

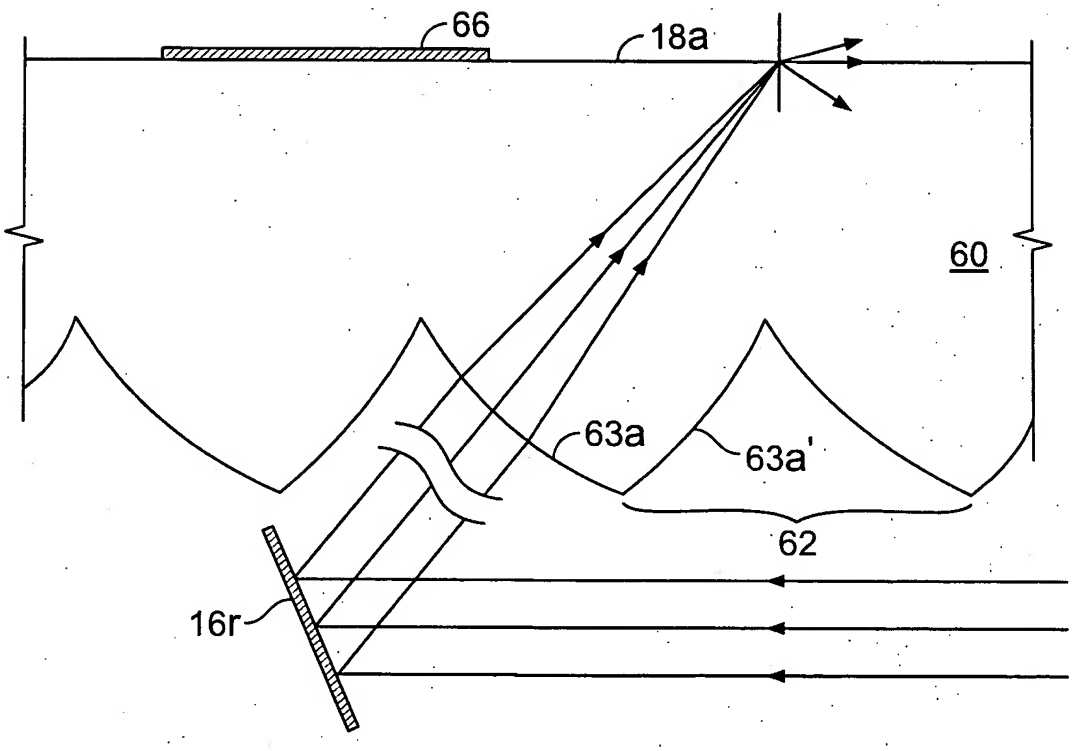


FIG. 3F

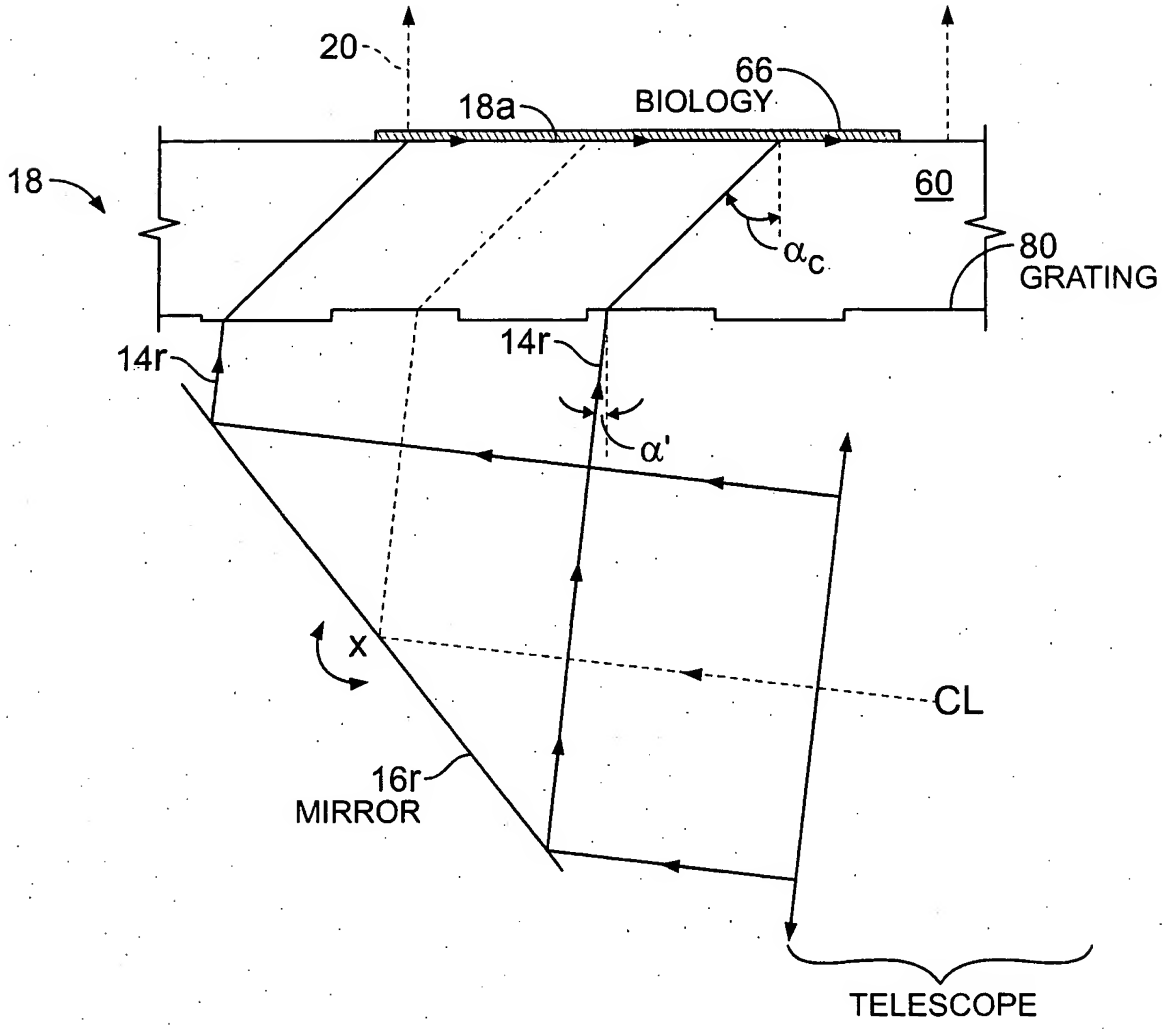

20
66
BIOLOGY
18a
18
60
α_c
80
GRATING
14r
14r
α'
x
CL
16r
MIRROR
TELESCOPE

FIG. 3G

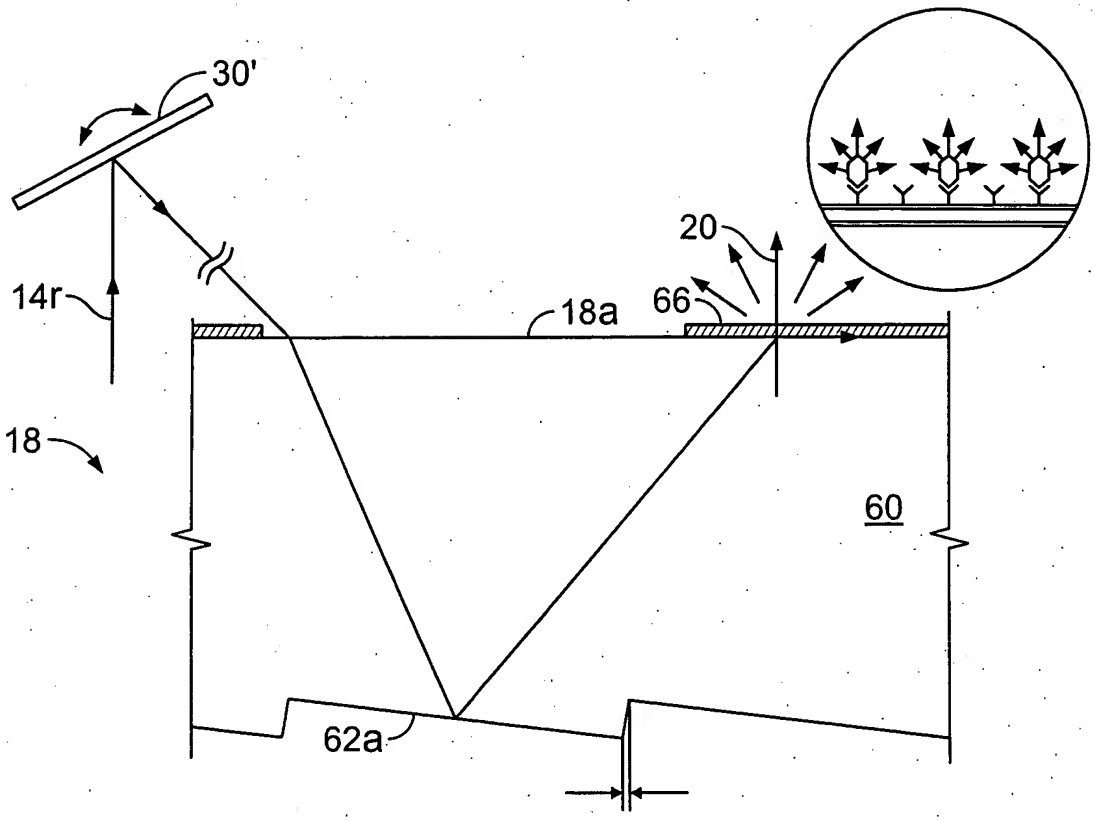


FIG. 4

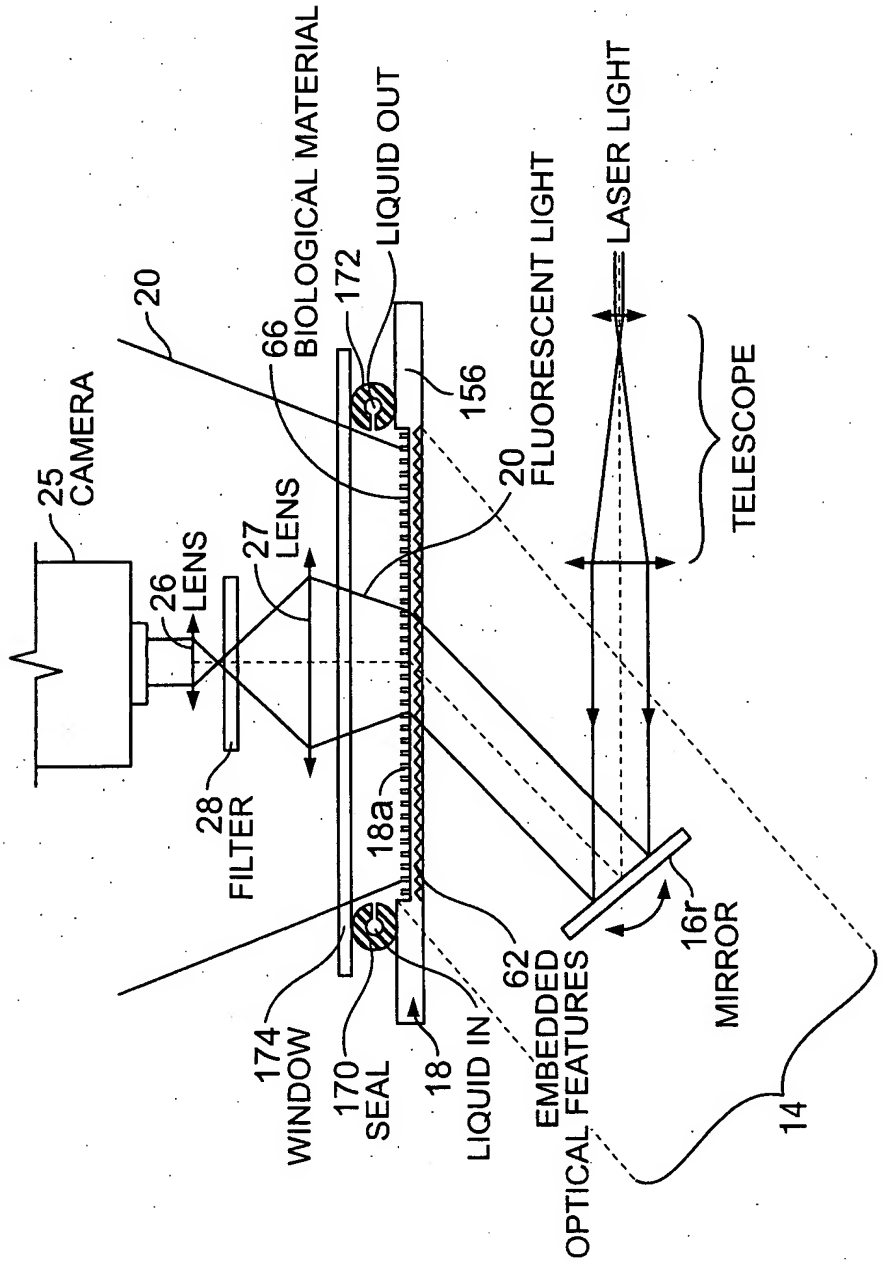

25
CAMERA
26
LENS
27
LENS
28
FILTER
20
66
BIOLOGICAL MATERIAL
172
LIQUID OUT
156
20
FLUORESCENT LIGHT
LASER LIGHT
TELESCOPE
18a
174
WINDOW
170
SEAL
18
LIQUID IN
62
EMBEDDED
OPTICAL FEATURES
16r
MIRROR
14

FIG. 5

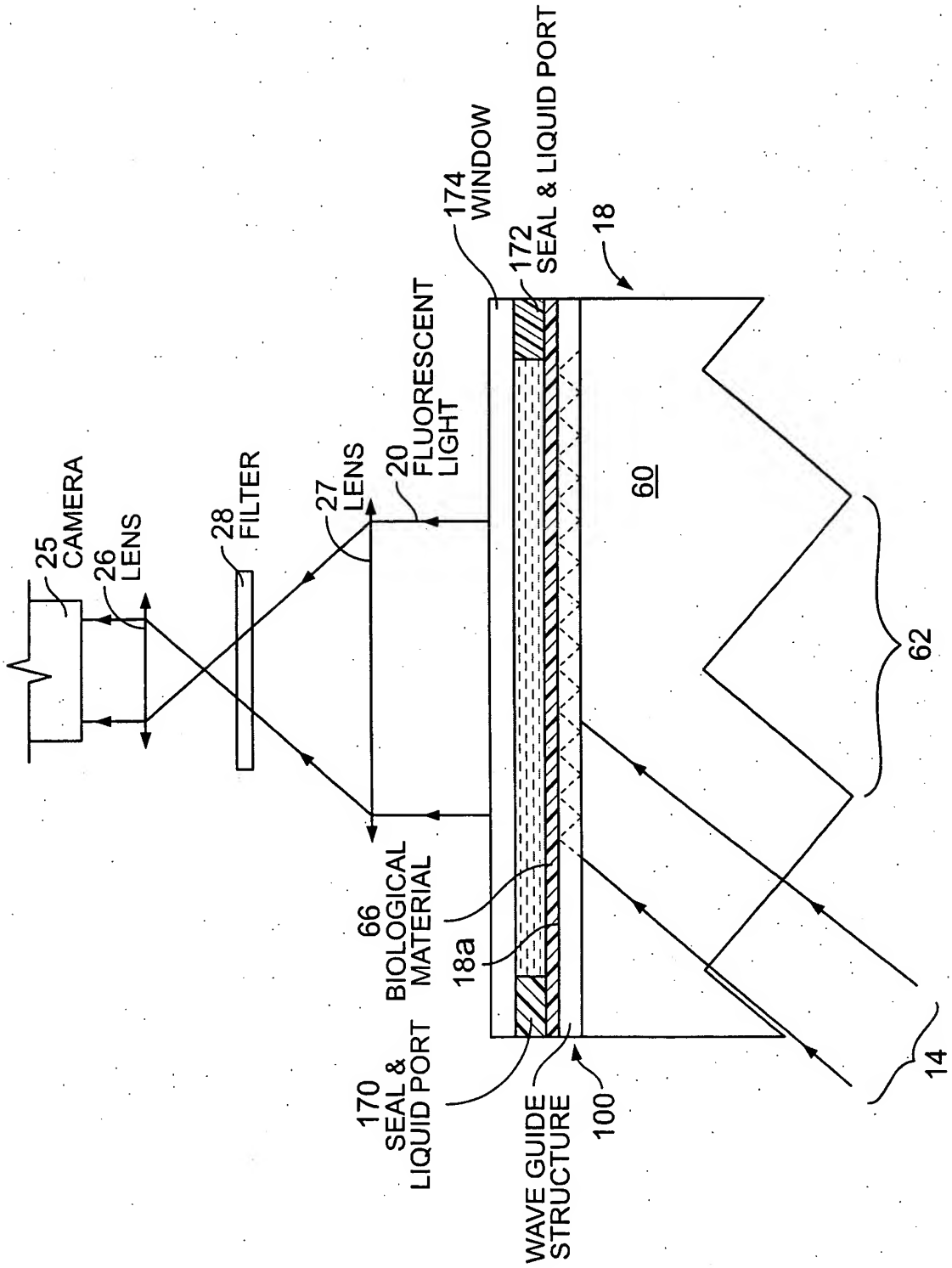

25 CAMERA
26 LENS
28 FILTER
27 LENS
20 FLUORESCENT LIGHT
174 WINDOW
172 SEAL & LIQUID PORT
18
60
62
66 BIOLOGICAL MATERIAL
18a
170 SEAL & LIQUID PORT
WAVE GUIDE STRUCTURE
100
14

FIG. 6

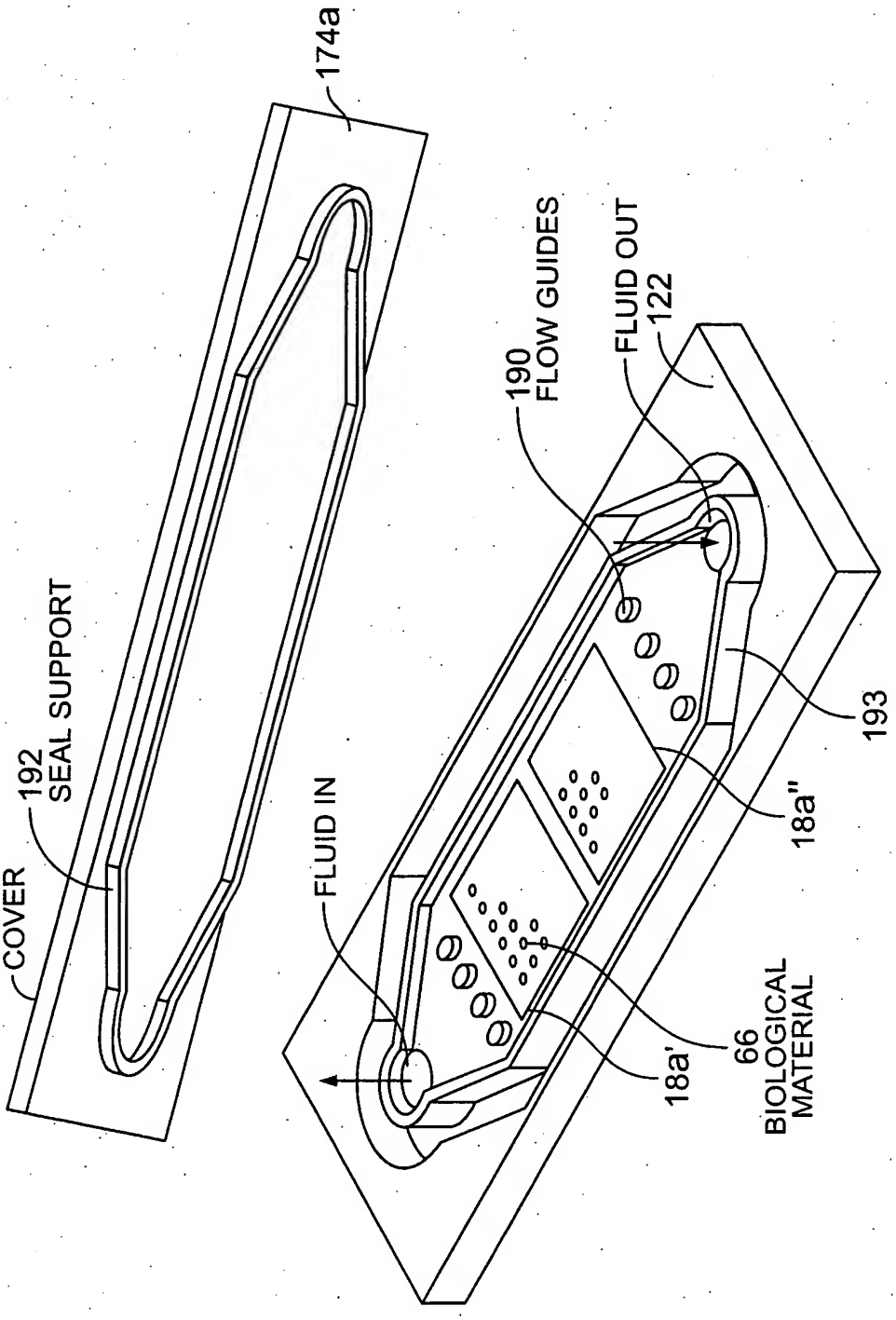

174a
190
FLOW GUIDES
FLUID OUT
122
COVER
192
SEAL SUPPORT
FLUID IN
193
18a"
18a'
66
BIOLOGICAL
MATERIAL

FIG. 6A

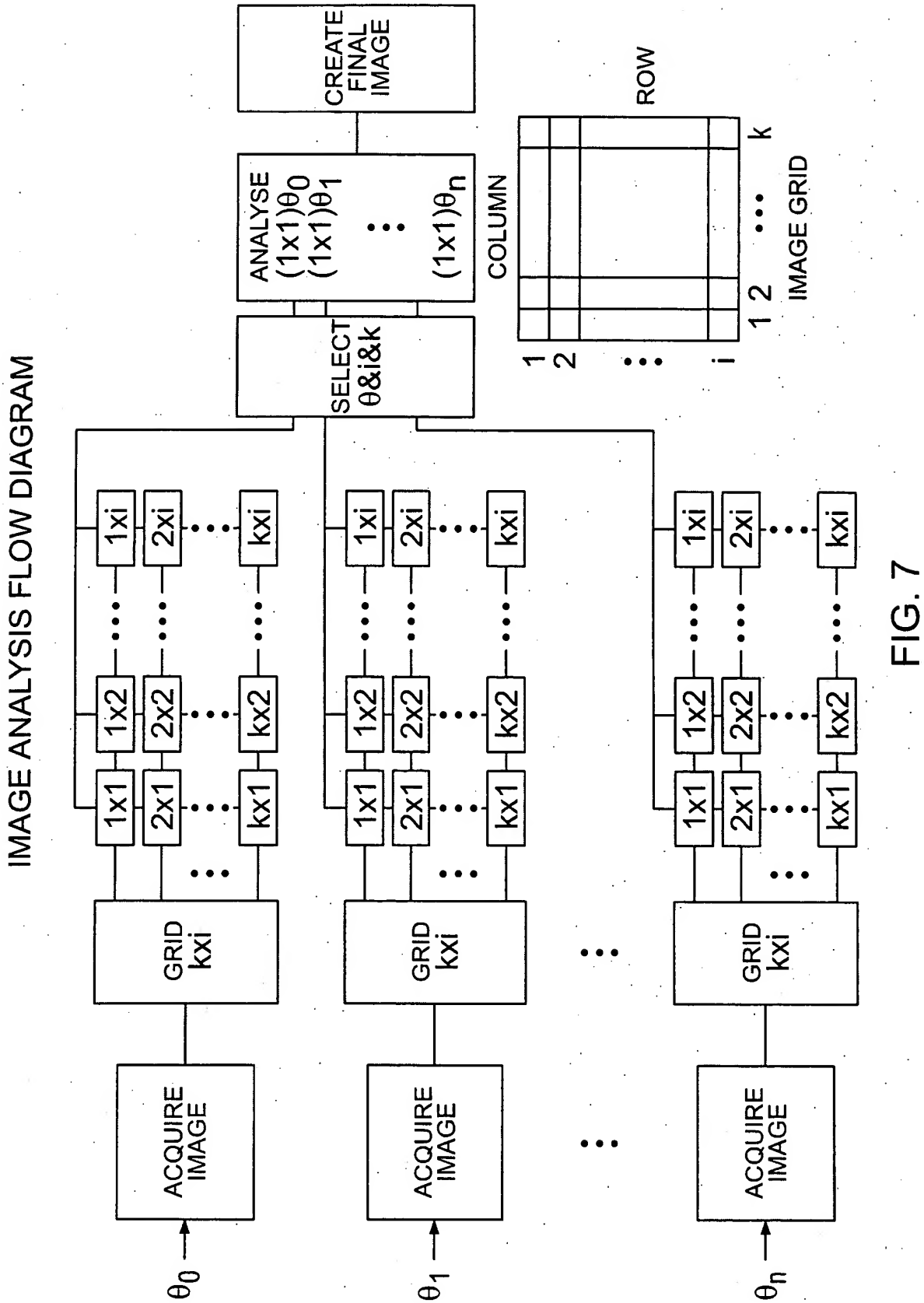


IMAGE ANALYSIS FLOW DIAGRAM
ACQUIRE IMAGE
GRID kxi
1x1
2x1
kx1
1x2
2x2
kx2
1xi
2xi
kxi
SELECT θ&i&k
ANALYSE (1x1)θ0 (1x1)θ1 (1x1)θn
CREATE FINAL IMAGE
COLUMN
ROW
IMAGE GRID
θ0
θ1
θn

FIG. 7

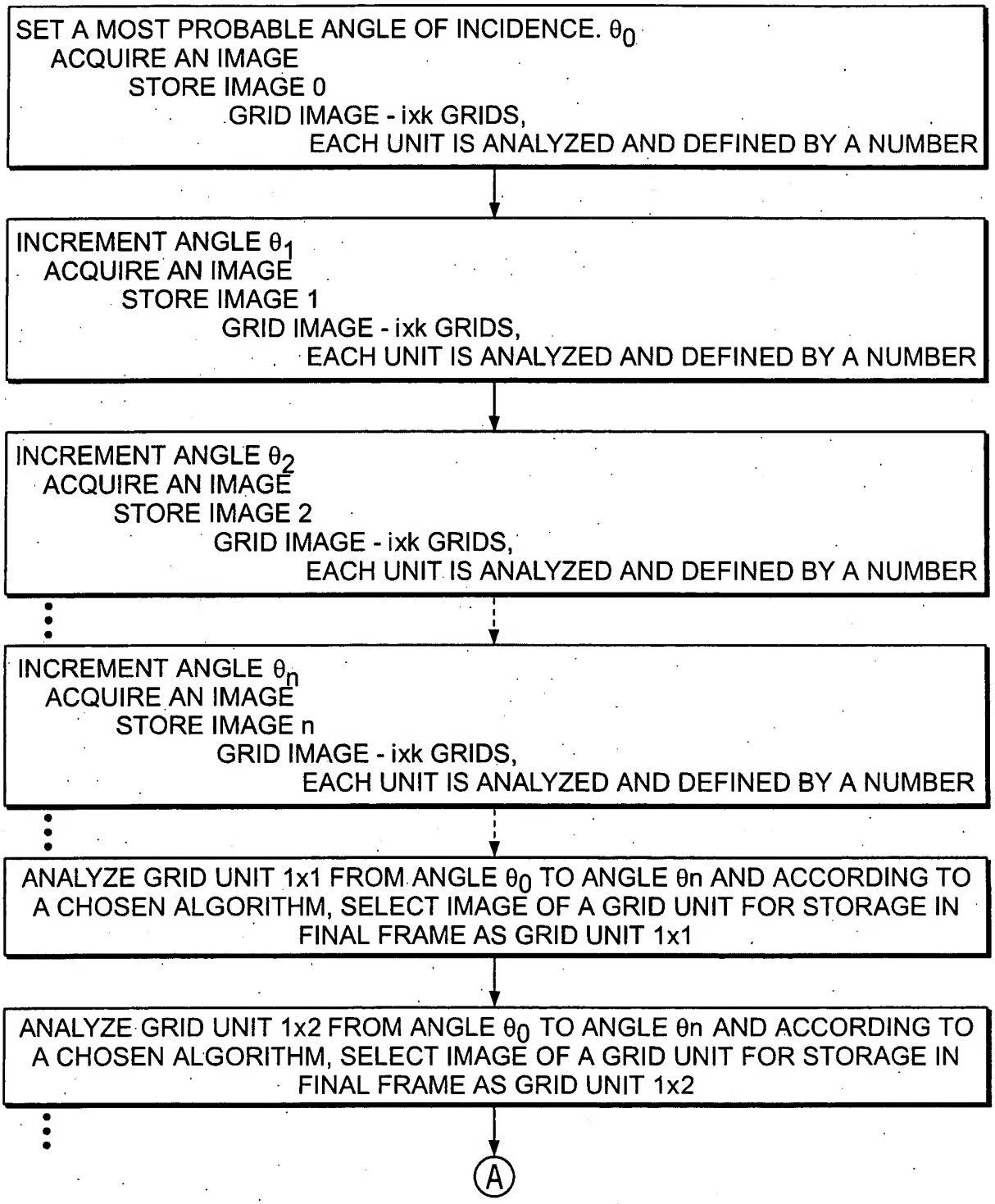

SET A MOST PROBABLE ANGLE OF INCIDENCE. θ_0
ACQUIRE AN IMAGE
STORE IMAGE 0
GRID IMAGE - ixk GRIDS,
EACH UNIT IS ANALYZED AND DEFINED BY A NUMBER
INCREMENT ANGLE θ_1
ACQUIRE AN IMAGE
STORE IMAGE 1
GRID IMAGE - ixk GRIDS,
EACH UNIT IS ANALYZED AND DEFINED BY A NUMBER
INCREMENT ANGLE θ_2
ACQUIRE AN IMAGE
STORE IMAGE 2
GRID IMAGE - ixk GRIDS,
EACH UNIT IS ANALYZED AND DEFINED BY A NUMBER
INCREMENT ANGLE θ_n
ACQUIRE AN IMAGE
STORE IMAGE n
GRID IMAGE - ixk GRIDS,
EACH UNIT IS ANALYZED AND DEFINED BY A NUMBER
ANALYZE GRID UNIT 1x1 FROM ANGLE θ_0 TO ANGLE θn AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT 1x1
ANALYZE GRID UNIT 1x2 FROM ANGLE θ_0 TO ANGLE θn AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT 1x2
A

FIG. 7A

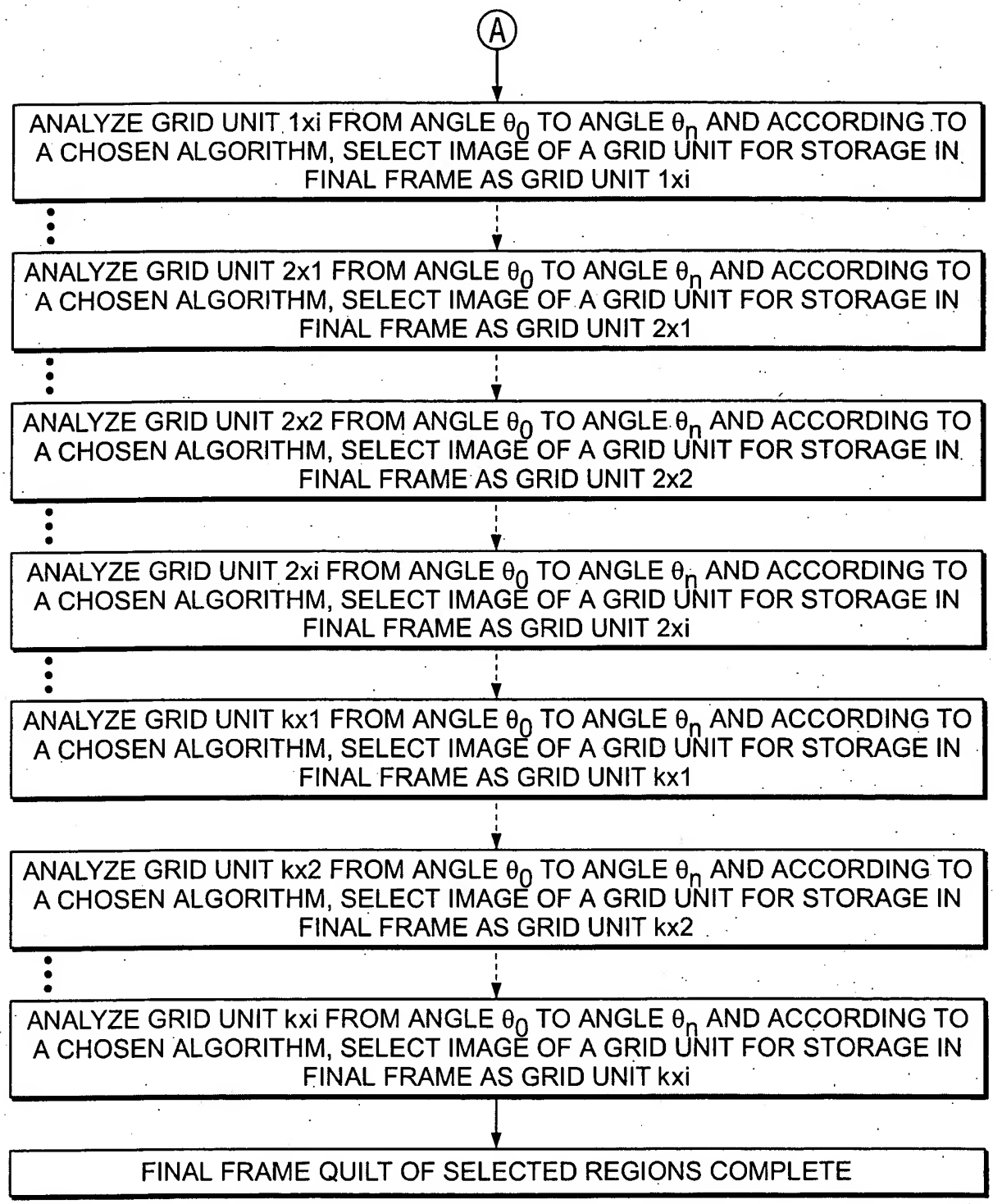

A
ANALYZE GRID UNIT 1xi FROM ANGLE θ_0 TO ANGLE θ_n AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT 1xi
ANALYZE GRID UNIT 2x1 FROM ANGLE θ_0 TO ANGLE θ_n AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT 2x1
ANALYZE GRID UNIT 2x2 FROM ANGLE θ_0 TO ANGLE θ_n AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT 2x2
ANALYZE GRID UNIT 2xi FROM ANGLE θ_0 TO ANGLE θ_n AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT 2xi
ANALYZE GRID UNIT kx1 FROM ANGLE θ_0 TO ANGLE θ_n AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT kx1
ANALYZE GRID UNIT kx2 FROM ANGLE θ_0 TO ANGLE θ_n AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT kx2
ANALYZE GRID UNIT kxi FROM ANGLE θ_0 TO ANGLE θ_n AND ACCORDING TO A CHOSEN ALGORITHM, SELECT IMAGE OF A GRID UNIT FOR STORAGE IN FINAL FRAME AS GRID UNIT kxi
FINAL FRAME QUILT OF SELECTED REGIONS COMPLETE

FIG. 7B

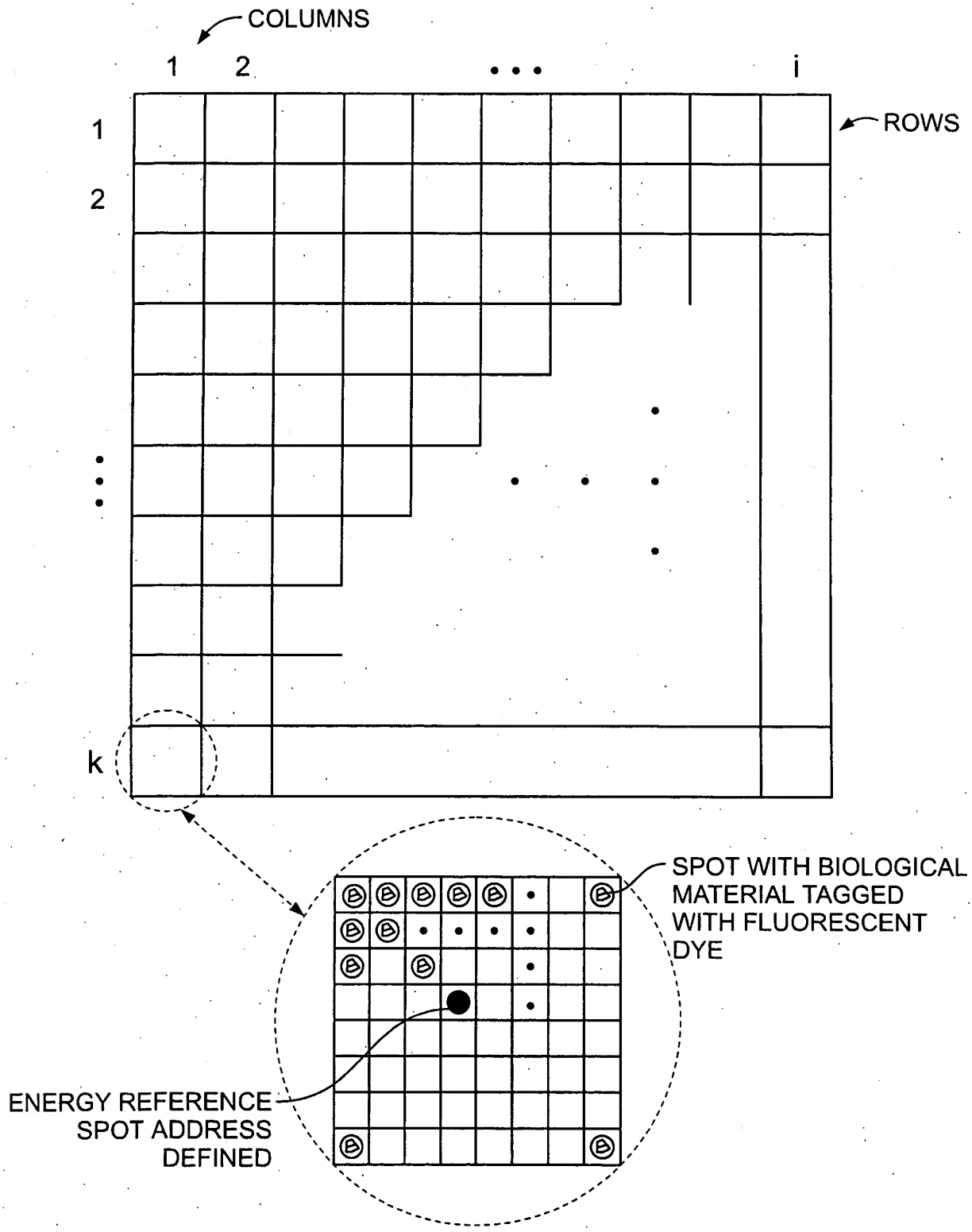
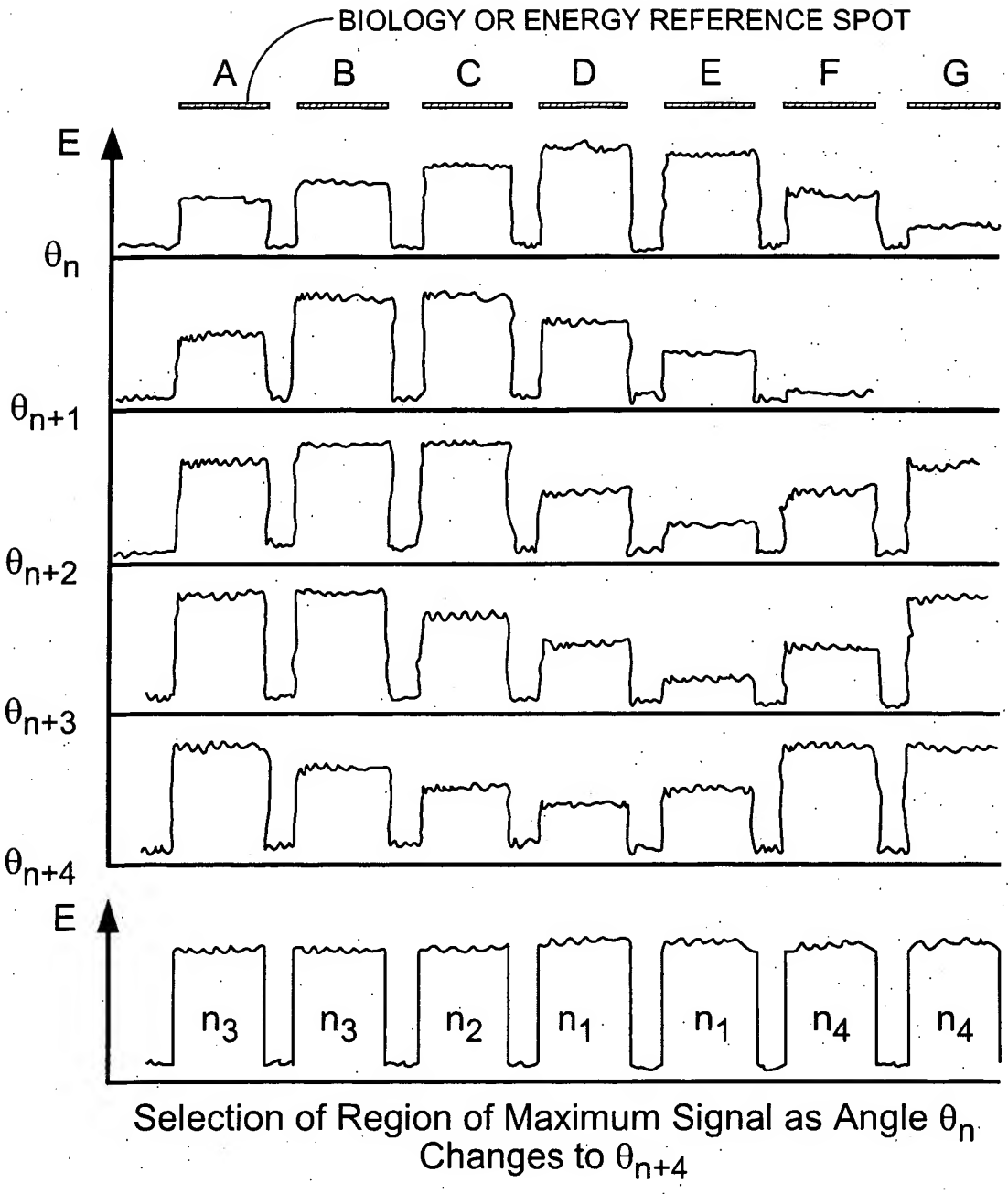

COLUMNS
1
2
i
ROWS
1
2
k
SPOT WITH BIOLOGICAL MATERIAL TAGGED WITH FLUORESCENT DYE
ENERGY REFERENCE SPOT ADDRESS DEFINED

FIG. 8



Selection of Region of Maximum Signal as Angle θ_n Changes to θ_{n+4}

FIG. 9

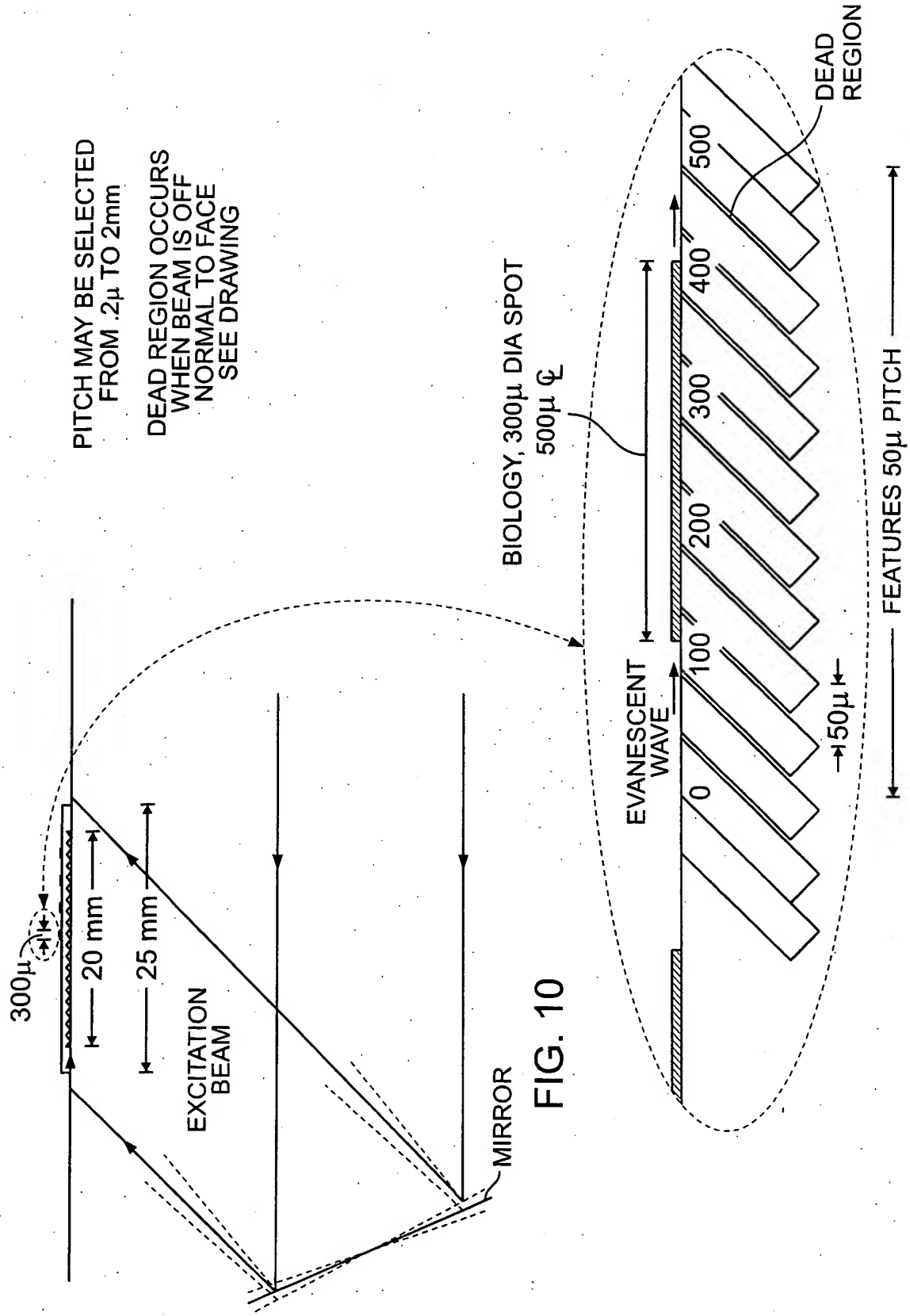


FIG. 10

FIG. 10A

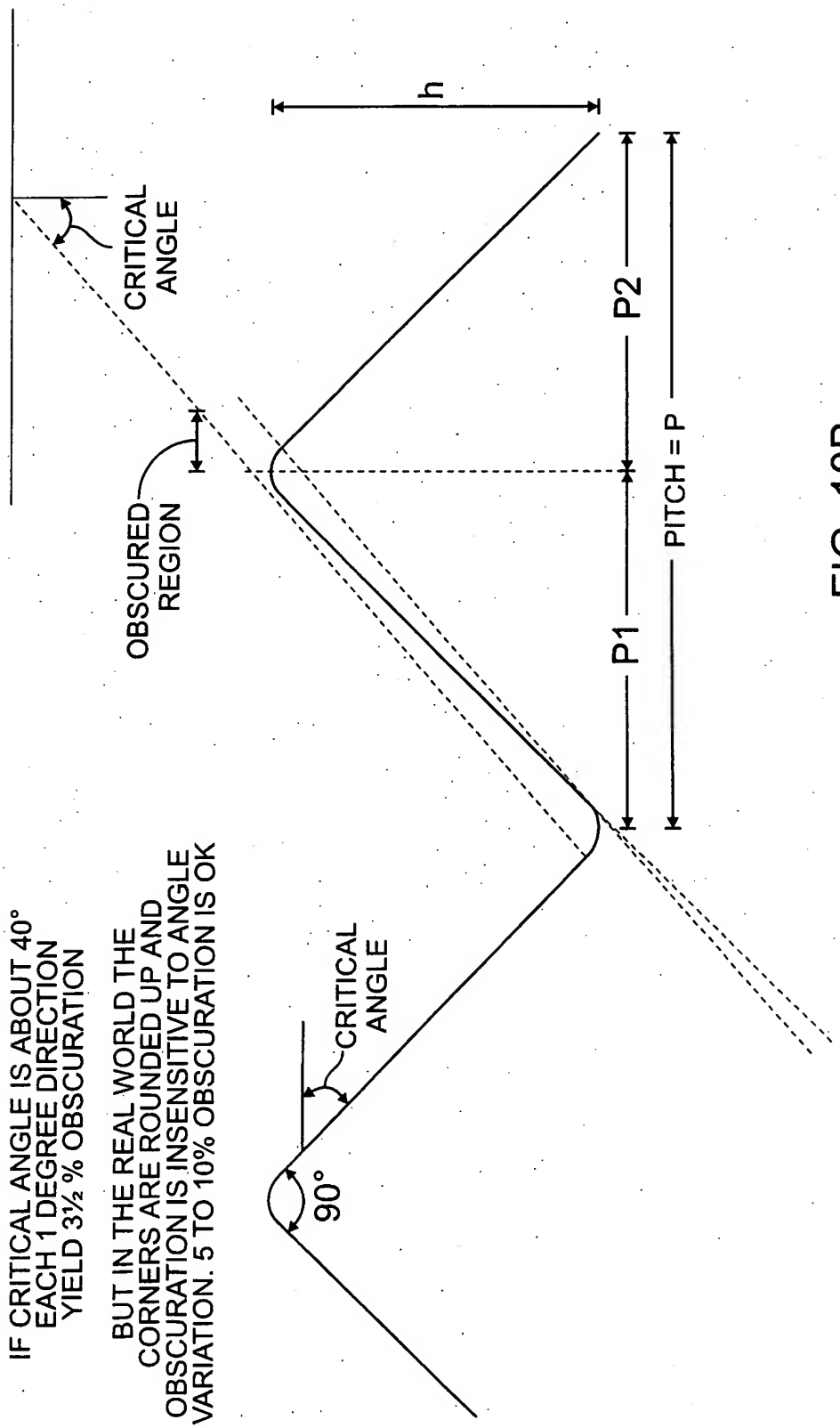

IF CRITICAL ANGLE IS ABOUT 40°
EACH 1 DEGREE DIRECTION
YIELD 3½ % OBSCURATION
BUT IN THE REAL WORLD THE
CORNERS ARE ROUNDED UP AND
OBSCURATION IS INSENSITIVE TO ANGLE
VARIATION. 5 TO 10% OBSCURATION IS OK
CRITICAL ANGLE
90°
h
P1
P2
PITCH = P
OBSCURED REGION
CRITICAL ANGLE

FIG. 10B